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Research Article

Open-heart Surgery for Congenital Heart Diseases at the University Hospital of Tengandogo: Epidemiologic, Diagnostic, Therapeutic and Evolution Aspects

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Abstract

Introduction: Congenital heart diseases (CHD) consist of abnormalities in the structure of the heart and / or main blood vessels, which occur before birth; they represent the most common birth defects in newborns. The prognosis has improved over the years due to availability of echocardiogram and better access to medical, interventional and surgical treatment. The aim of this study was to report the first series of open-heart surgeries done for congenital heart diseases in Burkina Faso, West Africa. *Methods*: It consisted of descriptive cross-sectional study with retrospective data collection. The study included of the patient who underwent open-heart surgery for CHD in the department of thoracic and cardiovascular surgery at the university hospital of Tengando over a period of 32 months, from January 1, 2021 to August 31, 2023. *Results*: a total of 46 patients were enrolled in the study and the male sex was predominant. There was no prenatal diagnosis and most of the CHD were discovered late. Recurrent bronco-pneumopathy was the most previous medical condition. All patients presented with dyspnea. Patients were operated under general anesthesia with invasive monitoring. Thorax was open by a median sternotomy. CHD included 31 left-to-right shunts (67.4%), 12 cyanotic CHD (26.1%) and 2 cases of obstructive CHD (4.3%). Right atriotomy was the approach used to close all atrial septal defects (ASD) and isolated ventricular septal defects (VSD). In the 11 cases of tetralogy of the study, 9 cases repaired with a conservation of the pulmonary valve. Average cardiopulmonary bypass time and aortic cross clamping were respectively 93.2 ± 38 minutes and 56.9 ± 27.8 minutes. Postoperative was uneventful in 42 patients (91.3%). Four patients presented complications that included bleeding in two cases. The mortality was nil. *Conclusion*: the majority of the patients were grown up and symptomatic children who were diagnosed late with the CHD. Although the surgeries were performed late, early results were satisfactory. The current challenge is to perform more surgery and progressively lower down the weight of the babies who undergo open-heart surgery for CHD in Burkina Faso.

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Keywords

Congenital Heart Disease, Open-heart Surgery, Complete Repair, Burkina Faso

1. Introduction

Congenital heart diseases (CHD) are the most common birth defects in newborns. They consist of abnormalities in the structure of the heart and/or main blood vessels, which occur before birth. CHD also include malformations related to the abnormal persistence after birth of structures normally present during fetal life [1, 2]. Globally, 8 to 9 newborns out of 1000 are born with CHD [3, 4], making it the most common congenital malformation in newborns. In Burkina Faso, the prevalence of CHD was estimated to be 9.8 per 1000 births according to a study conducted Kinda et al. over a period of 25 months from August 2009 to May 2010 and from October 2011 to December 2012. The symptomatology of CHD varies and often non-specific. The prognosis has improved over the years due to availability of echocardiogram and better access to medical, interventional and surgical treatment. The aim of this study was to report the first series of open-heart surgeries done for congenital heart diseases in Burkina Faso, West Africa.

2. Patients and Methods

2.1. Study Design

Over a period of 32 months, from January 1, 2021 to August 31, 2023, 46 cases of CHD were surgically operated in the Department of Thoracic and Cardiovascular Surgery of the University Hospital of Tengandogo, Burkina Faso. It consisted of descriptive cross-sectional study with retrospective data collection.

2.2. Surgical Procedure

All patients were installed in supine position with invasive monitoring including arterial and central veinous lines and temperature probe. General anesthesia was initiated through intravenous or inhalation induction. The preferred approach was the median sternotomy. Atrial septal defects (ASD) and ventricular septal defects (VSD) were approached through the right atrium. Repair techniques consisted of closing the defects with direct suturing or patches. The figure 1 shows the patient flow diagram.

2.3. Statistical Analysis

The data was processed and analyzed with Excel® 2016 software (Microsoft Office, WA, USA) and statistical formulas.

3. Results

3.1. Preoperative Characteristics

The study included 26 male patients and 20 female patients, resulting in a sex ratio of 1.3. The average age of patients at the time of diagnosis was 12.1 ± 10.4 years old, with extremes ranging from 9 months to 47 years (Figure 1). Patients came from rural areas in 47.8 %. Previous medical history included broncho-pneumopathy and recurrent rhinitis. The average duration of symptom progression was 4.4 years. Dyspnea was reported in all patients. Preoperative physical signs are illustrated in Table 1.

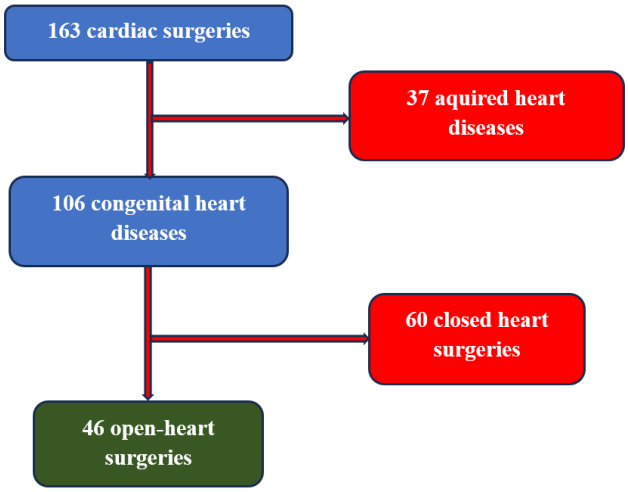

Figure 1. *Patient flow diagram.*

Table 1. Preoperative characteristics.

Pathology group	Physical signs	Frequency (N=46)	Percentage (%)
Left – to – right shunt	Failure to thrive	4	8.7
	Hepatomegaly	3	6.5
	Jugular vein distension	1	2.2
Obstructive CHD	Heart murmur	2	4.3
Cyanotic CHD	Cyanosis	7	15.2
	Hyperhemic conjonctivae	7	15.2
	Digital clubbing	10	21.7
	squatting	6	13.0
	Jugular vein distension	3	6.5
	Thoracic deformity	2	4.3

CHD: congenital heart disease

The electrocardiogram found a sinus rhythm in all patients except for eight who presented with right bundle branch block. The chest X-ray revealed cardiomegaly in 7 patients with cyanotic congenital heart disease including two cases of boot shaped heart. All patients underwent a cardiac ultrasound and the results of which are summarized in the Table 2.

Table 2. Distribution of patients according to echographic diagnosis.

Pathology group	Diagnosis	Frequency (N=46)	Percentage (%)
Left – to – right shunt	ASD	17	36.9
	ASD + PS	1	2.2
	VSD	11	24.0
	VSD + mid-ventricular stenosis	1	2.2
	VSD + aortic insufficiency	1	2.2
Obstructive CHD	Pulmonary stenosis	2	4.3
Cyanotic CHD	Tetralogy of Fallot	11	24.0
	DORV	1	2.2
TOTAL		46	100.0

ASD: atrial septal defect; CHD: congenital heart disease; DORV: double outlet right ventricle; PS: pulmonary stenosis; VSD: ventricular septal defect

3.2. Intraoperative Characteristics

The Table 3 summarizes the distribution of patients according to the surgical procedure (Figure 2). The average duration of cardiopulmonary bypass (CPB) was 93.2 ± 38 minutes. The average duration of aortic cross clamping was 56.9 ± 27.8 minutes. All patients received inotropic drugs therapy. The average duration of CPB support after cross declamping time was 19.3 ± 18 minutes.

Table 3. Intraoperative data.

Type of defect	Procedure	Frequency (N=46)	Percentage (%)
ASD	Bovin pericardial patch	13	28.3
	Autologus pericardial patch	3	6.5
	Direct suture	2	4.3
VSD	Patch closure by running suture	10	21.7
	Patch closure by intrerrupted suture	2	4.3
	Direct suture	1	2.2
Tetralogy of Fallot	Associated aortic valve repair	1	2.2
	Conservation of pulmonary valve	9	19.6
	Transvalvular patch	2	4.3
PS	Pulmonary valve commissurotomy	2	4.3
DORV	Intraventricular repair (tunnel)	1	2.2

ASD: atrial septal defect; CHD: congenital heart disease; DORV: double outlet right ventricle; PS: pulmonary stenosis; VSD: ventricular septal defect

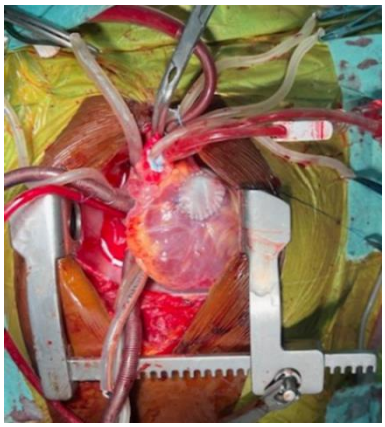

Figure 2. Intraoperation picture of tetralogy of Fallot repair.

3.3. Postoperative Course

The average length of hospital stay was 14.1 days, ranging from 7 to 30 days. Postoperative outcomes were uneventful in forty-two (42) patients. Complications were found in four (4) patients. Various complications found in these patients are reported in table 4. The mortality rate was nil.

Table 4. Postoperative complications.

Complication	Frequency (N=46)	Percentage (%)
Mediastinal bleeding	2	4.3
Neurological disorder	1	2.2
Pneumonia	1	2.2
Renal failure	1	2.2
Pleural effusion	1	2.2
Bedshores	1	2.2
Septic shock	1	2.2

4. Discussion

This inaugural work aimed to assess the epidemiological, diagnostic, therapeutic, and evolutionary aspects of patients who underwent open-heart surgery for congenital heart defects in our new cardiac center. Similar to Kinda's study in Burkina Faso [5], Belem in Senegal [6], and Ould Zein in Mauritania [7], the male sex was predominant. The average age of patients at the time of CHD diagnosis was three times more advanced compared to the average age of symptom onset. In our series, one third were diagnosed in early postnatal (before the age of 1 year) and the remaining two thirds, late postnatally. Likewise, all the studies in Sub Saharan Africa have showed an absent prenatal diagnosis and late postnatal diagnosis [8, 9] whereas more than 50% of CHDs were diagnosed prenatally in Europe [10]. Broncho-pneumopathy was the most common condition reported on the previous medical history. By contrast, Iselin et al. reported stage 2 NYHA dyspnea as the most dominant functional sign in their series [11]. Most of the patients were symptomatic similarly to African series [12-14]. ASD was the most common congenital

heart defect in our series similar to those of Mbaye et al. [15] in Senegal. The reason was that grown up children with ASD are the recommended cases for open heart surgery in any new cardiac surgery center. By the time passing and the learning curve of the team, smaller and smaller children with VSD will overtake in number. Median longitudinal sternotomy was exclusively performed in all our patients; the surgical procedures, cardiopulmonary bypass and aortic cross clamping times were similar to the Senegalese series [16]. There were few postoperative complications like the findings of Fall [17] in Senegal, which found a 5% complication rate. In our study, the cases were carefully selected to avoid the complex conditions as it was the first open heart cases ever. Follow up was quite short and so another future study is required to update the data many years to come.

5. Conclusion

Our study enabled the assessment of the results of open-heart surgery in the management of congenital heart diseases in Burkina Faso. Most of the patients were grown up and symptomatic children who were diagnosed late with the CHD. Although the surgeries were performed late, early results were satisfactory. The current challenge is to perform more surgery and progressively lower down the weight of the babies who undergo open-heart surgery for CHD in Burkina Faso.

Abbreviations

CHD	Congenital Heart Diseases
ASD	Atrial Septal Defect
VSD	Ventricular Septal Defect
DORV	Double Outlet Right Ventricle
PS	Pulmonary Stenosis
ToF	Tetralogy of Fallot
NYHA	New York Heart Association

Conflicts of Interest

The authors declare no conflicts of interest.

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